

TABLE 2-continued

P ₂ O ₅	15.1	15.7	15.7	15.7	15.7	15.7	15.7
ZrO ₂	7.0	2.0	2.0	2.0	2.0	2.0	2.0
Additives	—	TiO ₂ 2.0	SrO 2.0	Ta ₂ O ₅ 2.0	Nb ₂ O ₅ 2.0	K ₂ O 2.0	B ₂ O ₃ 2.0
Temperature-Rising Rate (°C./min.)	3	3	3	3	3	3	3
Retention	1000	1000	1000	1000	1000	1000	1000
Temperature (°C.)							
Retention Time (hr)	2	2	2	2	2	2	2
Type of Crystals	Apatite	Apatite	Apatite	Apatite	Apatite	Apatite	Apatite
Precipitated	Dopside	Diopside	Diopside	Diopside	Diopside	Dopside	Diopside
	Forsterite	Forsterite	Forsterite	Forsterite	Forsterite	Forsterite	Forsterite
	β-Tricalcium	β-Tricalcium	β-Tricalcium	β-Tricalcium	β-Tricalcium	β-Tricalcium	β-Tricalcium
	Phosphate	Phosphate	Phosphate	Phosphate	Phosphate	Phosphate	Phosphate
Bending Strength (kg/cm ²)	1500	—	—	—	1500	—	—

The glass-ceramic of the present invention contains a large amount of apatite crystals necessary for chemically bonding to a bone and has a very high bending strength of from 1,500 to 1,800 kg/cm². On the other hand, the conventional products such as a sintered body of a hydroxide apatite, a Na₂O—CaO—P₂O₅—SiO₂-based bioglass, a Na₂O—K₂O—MgO—CaO—P₂O₅—SiO₂-based glass-ceramic containing apatite crystals alone, and a glass-ceramic containing apatite and a wollastonite crystals have a bending strength ranging between 700 and 1,400 kg/cm². It can be therefore understood that the glass-ceramic of the present invention has a very high bending strength. Furthermore, in the glass-ceramic of the present invention, the bending strength does not almost vary depending on the production lot. Thus, the glass-ceramic of the present invention is very useful as a material for an artificial bone and an artificial dental root.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

What is claimed is:

1. A high strength glass-ceramic having a bending strength from at least 1500 kg/cm² and containing apatite crystals and at least one alkaline earth metal silicate crystal selected from the group consisting of diopside, forsterite and akermanite and having a composition consisting essentially of, in % by weight,

8 to 34% MgO;
12 to 43% CaO;
25 to 40% SiO₂;
10 to 25% P₂O₅;

with proviso of 90% or more MgO+CaO+SiO₂+P₂O₅,

0 to 10% Li₂O;
0 to 5% Na₂O;
0 to 10% K₂O;
0 to 10% SrO;
0 to 10% B₂O₃;
0 to 10% TiO₂;
0 to 10% Nb₂O₅;
0 to 10% Ta₂O₅; and
0 to 3% F₂,

with proviso of 10% or less Li₂O+Na₂O+K₂O+SrO+B₂O₃+TiO₂+Nb₂O₅+Ta₂O₅+F₂.

2. A process for producing a high strength glass-ceramic containing apatite crystals and at least one alkaline earth metal silicate crystal, which process comprises

molding glass powders having a particle size of 200 mesh or less and having a composition consisting essentially of, in % by weight,

8 to 34% MgO;
12 to 43% CaO;
25 to 40% SiO₂;
10 to 25% P₂O₅;

with proviso of 90% or more MgO+CaO+SiO₂+P₂O₅,

0 to 10% Li₂O;
0 to 5% Na₂O;
0 to 10% K₂O;
0 to 10% SrO;
0 to 10% B₂O₃;
0 to 10% TiO₂;
0 to 10% Nb₂O₅;
0 to 10% Ta₂O₅; and
0 to 3% F₂,

with proviso of 10% or less Li₂O+Na₂O+K₂O+SrO+B₂O₃+TiO₂+Nb₂O₅+Ta₂O₅+F₂,

heat treating the resulting molding in a sintering temperature range of the glass powders, and heat treating the molding in the temperature range where alkaline earth metal silicate crystals selected from the group consisting of diopside, forsterite and akermanite are formed.

3. A high strength glass-ceramic having a bending strength from at least 1500 kg/cm² and containing apatite crystals and at least one alkaline earth metal silicate crystal selected from the group consisting of diopside, forsterite and akermanite and having a composition consisting essentially of, in % by weight,

8 to 34% MgO;
12 to 43% CaO;
25 to 40% SiO₂;
10 to 25% P₂O₅;

1 to 10% Al₂O₃, ZrO₂ or both

with proviso of 90% or more MgO+CaO+SiO₂+P₂O₅+(Al₂O₃+ZrO₂),

0 to 10% Li₂O;
0 to 5% Na₂O;
0 to 10% K₂O;
0 to 10% SrO;

0 to 10% B₂O₃;
0 to 10% TiO₂;
0 to 10% Nb₂O₅;
0 to 10% Ta₂O₅; and
0 to 3% F₂,

with proviso of 10% or less Li₂O+Na₂O+K₂O+SrO+B₂O₃+TiO₂+Nb₂O₅+Ta₂O₅+F₂.

4. A process for producing a high strength glass-ceramic containing apatite crystals and at least one